Rapid Spacecraft Development Office News

September 2001

A Message from the Chief of the RSDO

We have had quite a busy summer in the RSDO. We are currently processing RFOs, receiving proposals, and selecting vendors for a flurry of Midex candidates, including OPUS, ACCESS, and DUET. Earlier this season , we also facilitated vendor selections for the MAGIC and SIRCE projects. All of these delivery orders are contingent upon the award of Midex funding, the proposals for which are due in mid-October. Watch for an update on these awards in the January issue of the RSDO newsletter.

At the end of August, we received proposals for the fourth on-ramp opportunity for the Rapid II program. On-ramp periods allow new vendors to submit proposals for inclusion in the Rapid II catalog, and provide the chance for existing vendors to add to or modify their offerings. During the next several weeks, we will be evaluating these on-ramp proposals.

In addition, RSDO personnel have participated in a number of outreach activities this summer. In conjunction with the Access to Space program, we sponsored an information booth at the Goddard Technology Showcase in June. I also made a presentation at the Showcase symposium, describing our program and services. In August, RSDO representatives attended the Fifteenth Annual Conference on Small Satellites at Utah State University. There we sponsored a booth with GSFC's Access to Space program and Integrated Mission Design Center (IMDC), and attended numerous technical sessions (See the article in this issue of the newsletter for details).

Other articles in this issue of the newsletter highlight our new fee structure (which will affect all customers), the RSDO price database, and a potential new customer—the Geospace Electrodynamics Connection (GEC) project.

As always, if you have questions or comments regarding the RSDO program or our services, please contact me at bill.watson@gsfc.nasa.gov, or via telephone (301-286-1289).

Bill Watson/RSDO Chief

STAFFING UPDATES

Meet LaVada Harris

LaVada joined RSDO August 13, providing contractor support as the new RSDO secretary. In her prior position at GSFC, LaVada served as a typist for a deaf student in one of Goddard's summer internship programs. She was responsible for attending meetings with the student, summarizing the proceedings, and typing the information on a laptop computer for the student to view—all in real-time! Previously, LaVada has taken computer courses at Pennsylvania State University and the Software Technology Computer Training Center, as well as additional courses at Prince Georges Community College. In her current position, LaVada will be assisting the RSDO Chief and staff with day-to-day business tasks. Welcome, LaVada!

CO'S CORNER

Just a Reminder…

The RSDO strongly encourages vendors to consider utilization of small or disadvantaged businesses as partners or subcontractors. We firmly endorse the goals regarding the use of Small and Disadvantaged Businesses (SDB), as stated in the Rapid II IDIQ contract.

NEW BUSINESS

The GEC Mission: A Potential RSDO Customer

The Earth's Ionosphere-Thermosphere (I-T) region is the site of complex electrodynamic processes that redistribute and dissipate energy delivered from the magnetosphere in the form of imposed electric fields and precipitating charged particles. Previous studies have revealed much about the composition and chemistry of the I-T region and about its structure, energetics, and dynamics. However, a quantitative understanding of this structured and dynamic system has proven elusive because of our inability to distinguish between temporal and spatial variations, to resolve the variety of spatial and temporal scales on which key processes occur, and to establish the cross-scale relationships among small-, meso-, and large-scale phenomena.

A "single" spacecraft mission to probe this inner boundary region of the geospace environment is not capable of unambiguously distinguishing between spatial and temporal variations. Multiple spacecraft are needed to resolve the different scale sizes and to understand the coupling processes between phenomena with different scale sizes. The Geospace Electrodynamic Connections (GEC) mission, targeted for launch in 2009, addresses this need for multi-point measurements in the Ionosphere-Thermosphere region.

The GEC mission, consisting of a cluster of up to four satellites, will provide focused multi-point measurements at altitudes below 300 km. The spacecraft, each with approximately 9 different instruments to measure in situ all relevant plasma and neutral atmosphere parameters, will be launched on a Delta II 2920. The satellites will be placed in the same high inclination (83^{o}), elliptical (~185 km by 2000 km) orbital configuration.

During the two-year primary mission, the distances between each spacecraft, in this "pearls-on-a-string" configuration, will be varied through the course of the mission from ~ 10 km to 1/4 of the orbit. Each spacecraft will carry a sufficient amount of hydrazine fuel to execute many weeklong dipping campaigns to altitudes near and possibly below 130 km, where atmosphere effects on plasma processes and spacecraft aerodynamics are preeminent. Late in the mission, depending on fuel availability, the spacecraft may be maneuvered into a petal orbit configuration to allow resolution of vertical structures.

To provide a non-intrusive instrument platform for in situ measuring of the ambient medium, the spacecraft will be 3-axis stabilized, have simple cylindrical geometries, and have electrically conducting surfaces. The flat ram face of the spacecraft will be the platform for thermal plasma and neutral gas measurements. The solar arrays are to be body mounted and electrically conducting to minimize perturbations of the plasma measurements due to spacecraft shadowing and spacecraft electric fields.

GEC spacecraft are to independently execute orbit changes and dip down into the dense edge of the Earth's atmosphere where atmospheric drag effects on the spacecraft are prominent. Precise formation flying and accurate control of the relative spacecraft positions is essential. This will entail the utilization of improvements in navigation (particularly inter-spacecraft ranging), and a consideration of inter-spacecraft communications and autonomous operations. Efficient aerodynamic design, lightweight structures and instruments, and maximally efficient power

systems will be needed to minimize expenditure of system resources and to maximize instrument duty cycles. Advanced technologies under consideration deal with reduced aerodynamic drag configurations, formation flying, lightweight instrument booms, highly efficient electrically conductive solar arrays and atomic oxygen resistant materials.

The NASA-selected GEC Science and Technology Definition Team (STDT), co-chaired by J. Sojka, (USU) and R. Heelis (UTD), completed its report in 2001. The Integrated Mission Design Center at GSFC developed preliminary spacecraft and systems designs in accordance with suggestions made by the STDT. Continuing aerodynamic and systems engineering studies are isolating the major challenges and cost/design drivers.

Additional details are available online at *http://stp.gsfc.nasa.gov/missions/gec/gec.htm*.

To request hard copies of the Science and Technology Definition Team Report, visit http://stp.gsfc.nasa.gov/missions/gec/gec_STDT_report.htm.

Based on an article by J. M. Grebowsky and R. P. Buchanan
GEC Project, NASA Goddard Space Flight Center

RSDO Plans New Fee Structure

Goddard's Code 400 management has challenged the RSDO to formulate a method to enable "full cost recovery" operations. In other words, the RSDO was encouraged to set up a structure whereby the fees charged for its services would support the costs incurred, without the need for external funding. Currently, part of the cost of RSDO services is subsidized by NASA's Code Y and Code S programs. In particular, the expenses needed to establish and maintain the RSDO catalog, related spacecraft data sets, the Computer-Aided Design (CAD) models, and the pricing history; and the costs required for web development and other support services, are borne by these external entities.

Presently, the RSDO can collect fees (0.5% of a spacecraft delivery order value or $150K, which ever is less) from non-NASA customers to aid in covering these costs. RSDO's NASA customers are not required to contribute additional money beyond the cost of their delivery orders.

To enable "full cost recovery" operations, the RSDO requires a new fee structure that will equitably distribute the costs associated with our services. For NASA missions, it is anticipated that there will continue to be no charge for placing study delivery orders; however, RSDO intends to charge a fee equal to 0.5% of the delivery order price for spacecraft or $250K, whichever is less. For non-NASA missions, the proposed charge for RSDO services will be equal to 1.5% of the delivery order price or $300K, whichever is less. We intend to implement this new fee structure once we gain approval from the Office of the Chief Financial Officer at GSFC.

We understand that this change in fee policy may be disruptive, and will work with our customers to address equitable adjustments on a case-by-case basis. Please feel free to contact Bill Watson/RSDO Chief with any questions or inquiries at 301-286-1289.

RSDO Participates in 15th Annual Small Satellite Conference

The RSDO attended the Fifteenth Annual American Institute of Aeronautics and Astronautics/Utah State University Conference on Small Satellites at Logan, Utah August 13-16, 2001. At the conference, we hosted a display with GSFC's Access to Space program and the Integrated Mission Design Center, to inform conference participants about our respective programs and services.

As always, we exchanged good information with our vendors, potential customers, and the academic community. The conference's keynote speaker, Lon Rains, of Space News Week, imparted advice for NASA and shared some interesting observations. In his opinion, NASA should stay the course on planetary exploration, and focus upon science, developing better sensors and helping program managers take risk. Industry needs the U.S. Government to be a stable customer.

The exciting theme at the conference this year was the progress made in the CUBESAT missions. The objective of this initiative, led by Professor Robert Twiggs of Stanford University, is to get students actively involved in building very small (picosat) satellites which fit into a 6 inch cube form factor. The program includes a CUBESAT dispenser developed for Expendable Launch Vehicles, and has arranged its first launch opportunity. The technology adaptation and exchange among the students created an air of excitement and accomplishment at the meeting.

The typical battery powered CUBESAT utilizes amateur radio for communication, and steel tape measures as deployable antennas. For attitude control, one group is using permanent bar magnets—which tend to grab the deploying tape measures. Their solution to this dilemma is to change to non-ferromagnetic tape measures!

Additional information about this meeting, including a conference schedule, list of exhibitors, and facts about next year's conference is available online at http://www.sdl.usu.edu/conferences/smallsat/.

By Bill Watson/RSDO Chief

RSDO Price Database Assists Mission Integration Managers

RSDO Mission Integration Managers (MIMs) are often requested to provide a spacecraft price range to customers in support of Announcement of Opportunity proposals for new programs, Roadmap missions, or new initiatives. Much of the difficulty involved in this task has been eliminated, thanks to RSDO MIM alumnus, Ron Miller, who spearheaded the RSDO price database development in July 1998 with Philip Chang and Francis Mo from Indyne Incorporated.

Using SQL as the search engine, and Visual Basic version 6.0 as the programming language, the team constructed a price database designed to enable MIMs to better estimate potential prices of spacecraft development. RSDO vendors provided information regarding core bus performance (CDRL 18), available options for various spacecraft subsystems, contract information (for Rapid I and Rapid II), and all the price data (core bus as well as options) for inclusion in the database. The tool is menu-driven and allows MIMs to project suitable bus candidates and estimate Rough Order of Magnitude prices based on modifications or deletions of pertinent spacecraft subsystems.

The first release of the price database, which included Rapid I data, occurred in December 1998. A second updated version was released in January 1999. After fine tuning the database further, and including information from the Phase A studies that were performed by RSDO for various missions, RSDO released a third version in March 2001. Currently, the entire Rapid II catalog is included in the database.

Please contact the RSDO (301-286-1289) if you have need of mission assessment and an expected price estimate.

By Naseema Maroof/RSDO Mission Integration Manager

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